

Irrigation Management

Irrigation management can have significant effects on the wine quality. While you can control water stress with planned irrigation at certain phenological stages in red varieties, in the white varieties water stress can compromise the freshness of the wine product. Monitoring soil moisture in the root area can provide fundamental indications when and how much water to apply to improve the quality, and at the same time preserving the quantity; e.g. apply water when there is an anticipated heat during the first vegetative development or flowering.

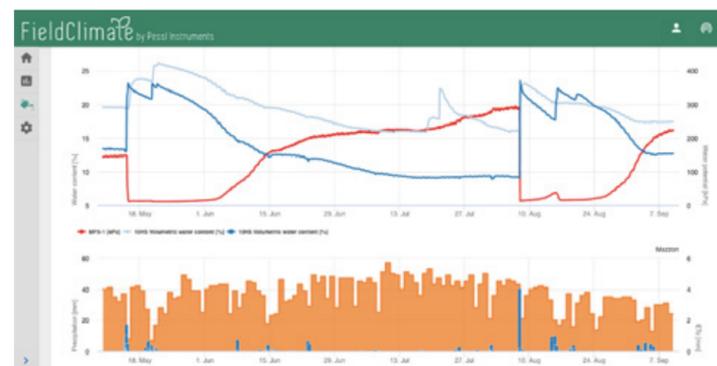
Pessl Instruments offers a wide range of OEM sensors for measuring soil moisture and other parameters, such as profile probes or fork like sensors. These sensors can provide measurements of volumetric water content (VWC) or tensiometric readings, which are used to measure tension (or suction) of the soil. The possibility to choose different technologies and sensors and combine them, allows you to design the best soil moisture monitoring solution based on the characteristics of your soil, irrigation systems, arrangement of the terrain and field management. Some of the soil moisture sensors can also measure soil temperature or bulk electrical conductivity (EC) or volumetric ion content (VIC), indications particularly useful for fertigation man-

agement. Thanks to water level sensors, pressure switches, and water counters the irrigation system can be monitored remotely.

All the meteorological variables can be also measured and combined with site specific weather forecasts and are accessible in near real-time on the FieldClimate platform. With rain data and other atmospheric variables (air temperature and humidity, wind speed, solar radiation), FieldClimate provides evapotranspiration and water balance calculations, which enables the user to optimize water management and crop productivity.

The weather and soil conditions play an important role in making the choice when to plant new grapevines. In the first few years it is important that we assist the post-transplant phase of the grape cuttings with irrigation, which can be achieved with the help of soil moisture sensors. The sensors will help you to obtain greater uniformity of development of the plant and better rooting. Soil moisture sensors also help to avoid problems linked to the first warm days, in some cases it allows the grower to anticipate the start of production. Also in the nursery the monitoring of soil moisture is a common practice, as careful management of irrigation can contribute to better develop the root system of the grape cutting.

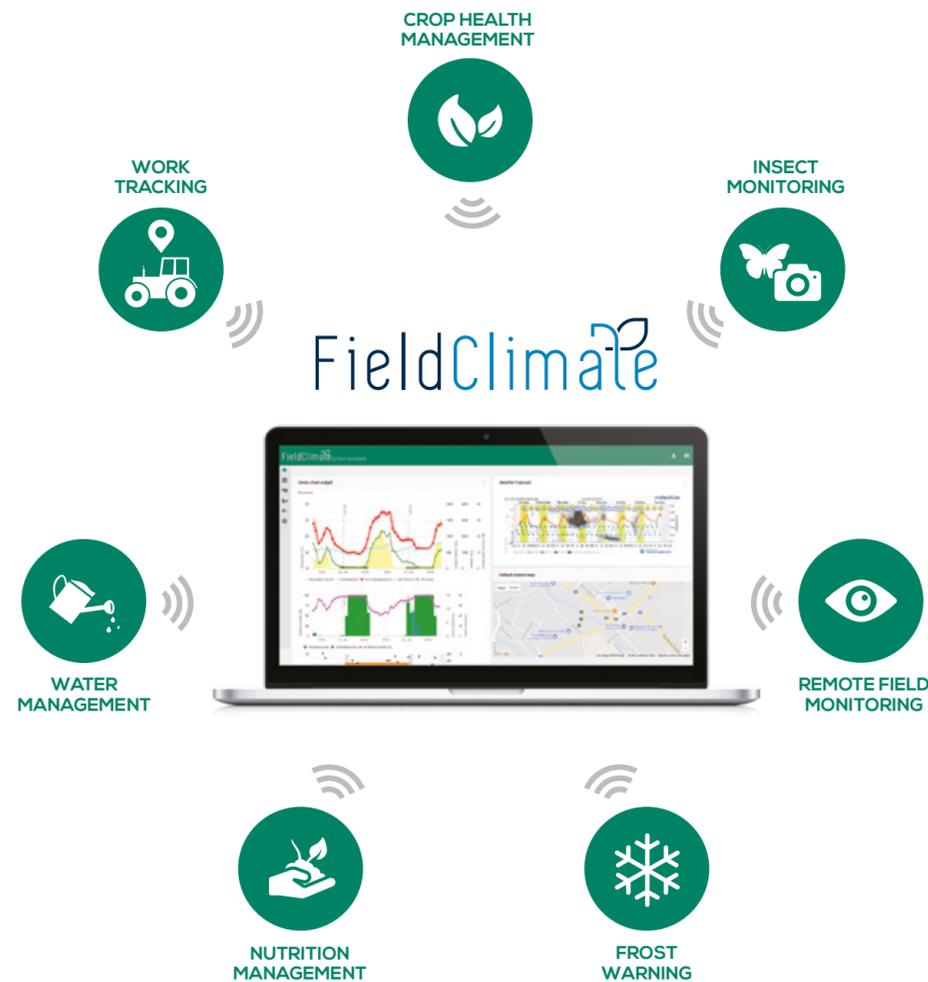
<p>SENTEK DRILL & DROP TRISCAN</p> <ul style="list-style-type: none"> • VWC • Soil temperature • Salinity • Length: 30, 60, 90, 120, 150 cm • Quick connection • Protected cable 	<p>METER ECH₂O 10HS</p> <ul style="list-style-type: none"> • VWC 	<p>METER TEROS 12 / ECH₂O GS 1</p> <ul style="list-style-type: none"> • VWC • Temperature • EC (0-23 dS/m) 	<p>METER TEROS 21</p> <ul style="list-style-type: none"> • Tension • 10-100.000 cbar/kPa • Temperature
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Combination of volumetric water content with two different depths (blue and light blue) and tensiometric data (red) measurements in one Pinot Noir adult vineyard. You can see the succession of drying and potential deficit phases, mitigated by irrigations and rains.



Holistic Solutions for Smart Agriculture



A complete range of wireless, solar powered monitoring systems under the iMETOS® brand comes together on the FieldClimate platform.

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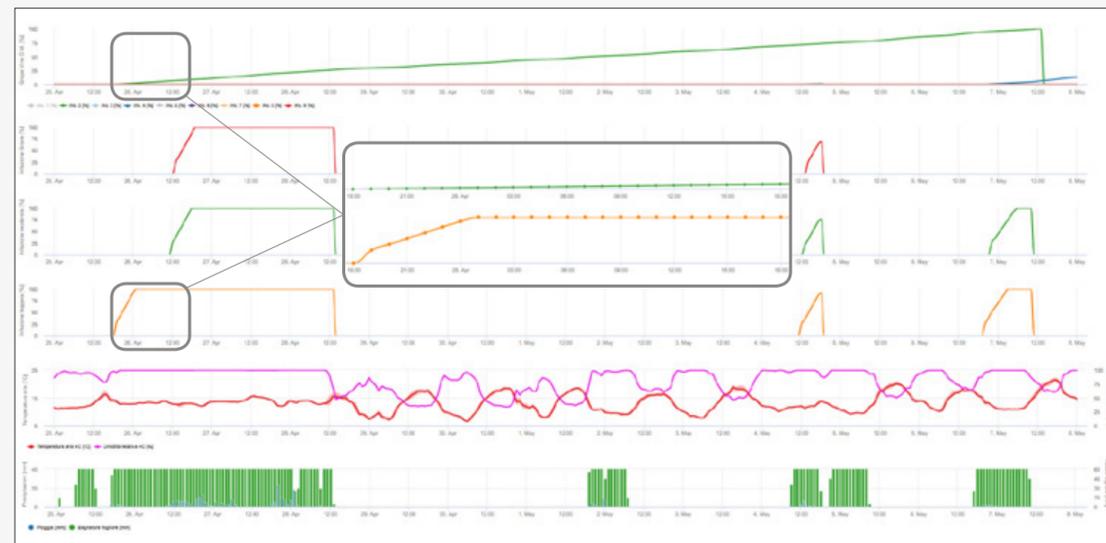
Disease Models

Meteorological information in the vineyard is of key importance for the decision-making process. It leads to the production of high-quality grapes and it is the starting point of the production of fine grapes.



The iMETOS line of products provides the raw data (rainfall, leaf wetness, temperature and humidity) that are used in the mathematical calculation of disease models. They are available through the ng.fieldclimate.com platform – for the main plant diseases and insects.

In the graph you can see how a period with rainfall, long intervals of leaf wetness and high relative humidity combined with air temperature is followed by the development of a primary infection of peronospora. When the infection reaches 100%, the model begins to calculate the incubation period for this infection. When 100% incubation is reached, symptoms are visible on leaves (oil spots).



The models have been validated through the years of use in the wide range of wine-growing areas and can provide:

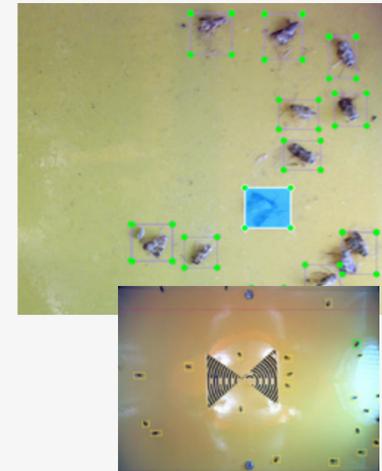
- Downy mildew (*Plasmopara viticola*): Primary infection according to Cortesi, Hill et al.; secondary infection according to Arens, Blaser and Gehman; incubation period time according to Mueller and Sleumer
- Powdery mildew (Powdery mildew risk according to Gubler and Thomas and powdery mildew risk modified to take into account the effects of *A. quisqualis*)
- Grey mould
- Black rot
- Anthracnose
- Leaf growth and rainfall accumulation
- Fungicide wash off
- Grape berry moth

To offer full support for plant protection management we collaborate with the Swiss partner meteoblue. Plant disease models are thus based on highly precise weather forecast which is localized and calibrated on the monitoring site. A forecast of all the main meteorological variables and other agronomic information, such as the window for phytosanitary interventions, is provided on an hourly basis, for 7 days and updated each time the service is accessed on ng.fieldclimate.com.

Insect Monitoring



To optimize field defence strategies, put an iMETOS iSCOUT® in your vineyard! It is an insect trap with integrated electronics and sticky plate that enables remote monitoring of insect population development such as the grape berry moth *Lobesia botrana* and *Drosophila suzukii*. iMETOS iSCOUT® uses an automatic learning algorithm (machine learning) for the recognition and the counting of insects. Accessibility of FieldClimate app from a PC or smartphone enables the technicians to manage the control operations in the territory more efficiently.



The Vineyard Takes a Selfie

With iMETOS CropVIEW® the vineyard is kept under remote control from any device. High resolution photos taken along the day allow precise monitoring of plant and disease development and enable you to plan your field operations. With online slideshow function you can create a time-lapse of your photos, showing the crop evolution in the field. It can also become an exceptional marketing tool for your production.



Frost Warning



Events from the recent past again proved how late frost is particularly insidious for the vine. But thanks to the combination of wet and dry bulb temperature sensor placed at the height of the lowest plants or fruits, SMS and integration alerts with site specific weather forecast for the next hours, you can set an appropriate frost defence strategy.

Soil Analysis

iMETOS® MobiLab is a mobile soil lab. It is a completely new concept which integrates soil nutrient analyses into a single microfluidic chip. After the soil samples are extracted from the field, the sample preparation is done right on the field or in the office and can be operated by users without prior laboratory knowledge. The filtered sample is injected into a lab-on-a-chip capillary where a strong electric field is applied. The dissolved nutrients are charged molecules, and therefore react to the electrical field. They are separated according



to their chemical nature and finally measured by a detector at the end of the capillary.



 **Co-financed by the European Union**
Connecting Europe Facility

This project has received funding from the European Union's Horizon 2020 research and innovation programme under the grant agreement No. 765262. The sole responsibility of this publication lies with the author. The European Union is not responsible for any use that may be made of the information contained therein.

Track and Monitor Work in Real-time

The Pessl Instruments product range is enhanced by iMETOS® Active and Object Trackers which help you monitor the position and operation of agricultural machinery and equipment.

